

Applicant : Douglas R. Becker  
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Attorney's Docket No.: 07844-451001 / P415

Amendments to the Specification:

Please replace the second full paragraph on page 3 with the following amended paragraph:

The invention provides methods and apparatus implementing a technique for forming a trap polygon, which does not interfere with the print quality of other trap polygons or objects. Edges in close proximity to a color transition edge (ACTE@) are checked for potential interference. A trap polygon is formed for the CTE that avoids any interfering edges or trap polygons for those edges. The technique can be applied to form a trap polygon for each edge in a page to be printed.

Please replace the last full paragraph on page 7 with the following amended paragraph:

FIG. 1 is a flowchart describing a technique for forming a trap polygon around a color transition edge (ACTE@). The technique can be executed as a process on a processor, which can be located in a computer system or a printer. The system performs the steps described below to form a definition of the desired trap polygon as a preprocessing step before printing or rendering a page including multiple graphical objects. The process can be applied to each edge in an electronic document.

Please replace the last paragraph starting on page 7 with the following amended paragraph:

The system shapes the trap polygon to avoid overlaps with interfering edges and other trap polygons. Edges are the boundaries of graphical objects. The CTE is an edge bisecting two color regions, which presents a risk of misregistration or other printing problem. The CTE and trap polygon are defined in a vector space as points connected by segments. All of the

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operations of the process can be performed in vector space. Each edge is defined by two points. The trap polygon includes at least three points. Segments of the trap polygon which share an endpoint with the CTE are referred to as *Asides@* of the trap polygon. The remaining segments of the trap polygon are part of either end. The trap polygon also includes an associated trap color that is determined by the colors on either side of the CTE.

Please replace the first full paragraph on page 8 with the following amended paragraph:

The system identifies a trappable edge or CTE (step 102). A CTE is an edge that satisfies a trap condition, such as exceeding a certain color difference between the colors defined on either side of the CTE. The system can use a conventional method to identify CTEs. Thus, the system generates a trap polygon for each CTE satisfying a trap condition and then shapes that trap polygon, as described below. Alternatively, the process can be adapted to shape a trap polygon separately generated by a conventional method. Identifying the CTE includes identifying a trap color for the CTE. The trap color *Aspreads@* the lighter of the two colors on either side of the CTE into the darker color. For example, if the color on one side of a CTE is 10% cyan, 20% magenta, 30% yellow, and 40% black, and the color on the other side is 40% cyan, 30% magenta, 20% yellow, and 10% black, the trap color is 40% cyan, 30% magenta, 30% yellow, and 40% black.

Please replace the last paragraph starting on page 8 with the following amended paragraph:

The system identifies edges, which are potentially interfering edges (step 105). Potentially interfering edges can be color transition edges for different graphical objects or other edges in the same object as the CTE. Potentially interfering edges intersect an interference or *Akeep away@* zone defined by the CTE, described below. The system screens the identified potentially interfering edges for interfering edges, which present a significant risk of interference

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(step 110). Interfering edges are edges of objects that are a significantly different color than the trap color of the trap polygon. Methods for locating interfering edges are described in greater detail in co-pending application entitled "ATrap Shaping@", filed January 29, 1999, assigned serial number 09/240,946, the contents of which are expressly incorporated herein by reference.

Please replace the last full paragraph starting on page 10 with the following amended paragraph:

Methods for forming a side of a trap polygon are described in greater detail in "ATrap Shaping@".

Please replace the first full paragraph on page 11 with the following amended paragraph:

After forming the sides and ends defining the basic trap polygon in steps 205 and 210, the system clips any self-intersecting sections from the basic trap polygon (step 215). That is, the system clips portions of the trap polygon as appropriate so that the basic trap polygon is a single enclosed polygon encompassing the CTE without overlapping sides. Methods for clipping trap polygons are described in greater detail in "ATrap Shaping@".

Please replace the second full paragraph on page 11 with the following amended paragraph:

After clipping any closed sections, the system forms a composite trap polygon by trimming the basic trap polygon (step 220). More specifically, the system trims sections of the trap polygon which intersect with interfering edges. Methods for trimming trap polygons are described in greater detail in "ATrap Shaping@". Thereafter the system re-shapes the composite trap polygon to avoid interfering edges and trap polygons corresponding to those interfering edges (step 225).

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Please replace the last full paragraph on page 11 with the following amended paragraph:

FIG. 3 is a flowchart for re-shaping the composite trap polygon formed in step 220 (step 225 in FIG. 2). FIGS. 4A - 4D illustrate an example of applying the steps of FIG. 3 to a composite trap polygon 4001000.

Please replace the last paragraph on page 13 with the following amended paragraph:

After adding the placeholder points to the composite trap polygon, the system generates a miter equation for each point on the composite trap poly. (312). Each miter equation defines a line on which traps from the CTE and an interfering edge would optimally abut one another. More specifically, a miter equation defines the line that splits the distance between the interfering edge and the CTE for which the current trap is being generated. By locating the miter line half way between the CTE and the interfering edge, consistent shaping information can be generated to produce traps for both edges. The shaping information (miter line) can be re-created when the position or function of the two edges (i.e., when trapping the Ainterfering edge@ in view of the CTE) is reversed. Miter equations are calculated such that the keep away movements caused by the interfering edge (edge A) on the CTE (edge B) trap polygon are located in the same (or within a predetermined distance) location as when the edge A is processed as the CTE and edge B is the interfering edge. In one implementation, the system generates a miter equation for each point on the composite trap polygon using the feature closest to the point.

Please replace the last paragraph on page 17 with the following amended paragraph:

As described above, the miter equation for a given point on the trap polygon is calculated with reference to the closest point on the closest feature in the keep away zone to the point. In one implementation, an additional check is added in the process prior to moving any point on the

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trap polygon. This test is done on an individual basis as the points are processed. The system checks to determine if the movement of the point to the intersection of the calculated miter equation and the movement equation will result in the point being too close to the CTE. In one implementation, a point is too close if its proposed new location is less than half of the distance between the CTE and the closest point on the closest feature that resides in the keep away zone. Alternatively (or in addition), a point can be determined to be too close if its proposed new location is less than half of the distance between the CTE and the closest point on the feature being considered. If the point is too close, then the system locates an Aoptimal@ intersection point (an intersection of a miter equation associated with a feature in the keep away zone and the movement equation) whose distance to its associated feature is smallest and moves the point to that optimal intersection point.

Please replace the first full paragraph on page 19 with the following amended paragraph:

FIG. 4 G shows the results after locating the Aoptimal@ intersection point (the intersection point that is closest to its associated feature). The intersection point 462 corresponds to the intersection of miter equation 460 (associated with all points on edge 471 between points 470 and 472) and movement equation 452. Accordingly, point 1 is moved to intersection point 462. Point 462 is farther away from the CTE 420, but is the closest intersection point for all points on interfering edges located in the keep away zone. Thereafter, the process can continue for all other points in the trap polygon (points 2, 3, 4 and 6) resulting in the movement of points 2 and 3 to the intersection points 464 and 466, respectively (where points 464 and 466 are the intersection of movement equations 454 and 455, respectively, with miter equation 460).